ECOLABELS AND ECONOMIC EFFICIENCY:

SOME PRELIMINARY RESULTS

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Abstract

The public provision of information about the environmental performance of firms and products has generated considerable enthusiasm and become a common instrument of environmental regulation, even though the economic analysis of the social welfare properties of these policies is quite limited. This paper proposes a model for examining these properties.

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Introduction

Numerous governments, regulatory bodies and independent organizations have recently implemented a variety of programs designed to disseminate information about the environmental "attributes" of companies or products. Some of the programs disseminate information about companies, but most focus on individual products. Possible targets of the information include consumers, investors, voters, neighbors, and local public health and safety officials. The nature of the information ranges from raw, technical data, to information that has been distilled into some form of label, grade or certification, such as *eco-labeling* and *report card* programs (we shall refer to these programs collectively as "environmental labels" or simply "labels").

The popularity of environmental labels, and of information provision more generally, is due in large part to their appeal to a wide variety of constituents. For libertarians and consumer rights advocates, information provision strikes a blow for citizens against both big government and big business. For politicians and regulators, the absence of any requirement beyond disclosure limits confrontations with the regulated population. For conservatives, it is free-market environmentalism in (nearly) pure form. For liberals, it provides a way for people to behave in a socially responsible way. For the pragmatist, it is cheap, whether or not effective. For environmentalists, it is better than nothing, which is quite often the alternative.

Here, then, is the ultimate use of the market mechanism. No one is obliged to act in any particular way or, indeed, to act at all. Nor, is any particular result ordained by the government. Products themselves, or the processes by which they are made, may, but need not, be changed. And consumers need not opt for the environmentally "better" product. However, if they do, one result may be a sort of "warm glow," a bonus not unlike that produced by participating in

voluntary recycling or a morning spent cleaning public areas such as highway verges. It may also be possible that those who do not choose the environmentally superior product will suffer from some form of environmental guilt or diminished utility due to social stigma.

Best of all, information provision has been shown to "work" in the sense that publicly provided information seems to have influenced some private decisions, which, in turn, has arguably changed firms' environmental practices. This evidence has been most highly developed in the case of a program providing information on individual manufacturing facilities or plants - the U.S. Toxics Release Inventory. (See Konar and Cohen, 2001; Khanna, *et al.*, 1998; Konar and Cohen, 1997; Hart and Gautum, 1996; and Hamilton, 1995). However, there is also evidence that environmental labels have prompted changes in consumer behavior. For example, using Danish consumer diary data, Bjørner, *et al*, found statistically significant levels of consumer choice of more expensive, eco-labeled laundry detergents and toilet paper brands. (Bjørner *et al*, 2003). Other examples include studies of the introduction of dolphin-safe tuna labeling (Teisl, *et al.*, 2002), electricity markets (Roe, *et al.*, 2001a), and point-of-purchase information on laundry detergents (Henion, 1972).[2]

Thus, there are both *a priori* reasons for enthusiasm and some evidence of positive effects behind the push to use information provision as an alternative to more intrusive regulation or pricing in the environmental policy arena. However, despite their popularity and the emerging empirical evidence of their effectiveness, there has been little analysis of the economic performance of these programs and how that performance is tied to the details of design. To put

this gap in perspective, it is useful to contrast environmental labels with other "market-based instruments," charges per unit (of pollution, or fish landings, or other environmental stressors) or marketable permits (to discharge so much pollution, or land so many tons of fish, *etc.*). In these latter cases, years of research have laid an extensive foundation to allow policy analysts to tell policy designers, for instance, what they will have to know and do to achieve the least-cost solution to the common problem of meeting a politically chosen set of ambient environmental standards. Much is also known about what these alternative policy instruments promise on other dimensions, such as the relative strengths of the spurs they provide to environment-friendly technical progress. Further, a fairly rich vein of actual experience shows how the tension between a bureaucratic search for more control and the need of private participants for predictability can lead to unworkable designs. Part of this work and experience existed in time to inform the great experiment with tradable SO_2 discharge permits that began in the U.S. with the 1990 Clean Air Act. For example, the Fox River experiment with tradable permits to emit pollution to a river had been found to have some serious design flaws that would have made actual trades unlikely, even if the setting chosen had been more promising. (See, David, 2003, for the history and facts; and, more generally, Dudek and Palmisano, 1988).

By comparison, with labels we are flying blind, or nearly so. There is by now some knowledge of which choices of sponsorship, information form, and information content seem to lead to the largest responses (e.g., Teisl, *et al.*, 2002; Roe, *et al.*, 2001a and b; Kane, *et al.*, 2000; Teisl, *et al.*, 1999; OECD, 1997; and USEPA, 1994.). But there is no basis for *a priori*

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[2] There are more studies analyzing programs that simultaneously convey information on both public and private product attributes, such as organic food (environment and health) and energy-conserving appliances (environment

statements about whether, and if so, how, labeling programs can be cost-effective in obtaining desired environmental outcomes such as ambient quality standards, or whether they can be ranked even roughly on the scale of comparative size of the incentive they provide for technical progress. In large part, this is because we lack a simple, successful model of how labels "work." In particular, while we know that some consumers are willing to pay more for goods labeled as environmentally friendly, we do not know why.[3]

Consumer response to the provision of environmental information is especially intriguing because of the tantalizing market power wielded by informed, motivated consumers and because of the uncertainties surrounding this motivation. As economists see it, there are essentially two possible explanations of this motivation. First, consumers are behaving as rational decision-makers by attempting to incorporate the effects of the degradation of the natural environment from the production of goods and services on their well-being into their consumption decisions, but mistakenly overestimating the impact of their individual consumption decisions. After all, the environmental improvement any single consumer purchases for herself by buying a labeled laundry detergent, say, is vanishingly small, at best.[4] A second possibility is that some consumers simply have a preference for environmentally-preferable products because of their "public spirit" or the "warm glow" they receive from doing "the right thing," or what Sen, 1973,

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and expense).

3 In considering consumer motivation, it is important to distinguish between public and private concerns. Thus, we can think of two quite different rationales for purchasing an ENERGY STAR® appliance - because reduced energy consumption saves you money (private) or because it reduces greenhouse gas emissions (public). The former fits quite easily with common economic definitions of rationality, the second much less so.

4 If an individual's consumption decisions have no measurable effects on the ambient environment and the consumer realizes this fact, then whether or not the consumer is selfish (only concerned with his or her own well-being) or "altruistic" (also concerned with other's well-being) is irrelevant to their response to the provision of environmental information.

called “commitment,” in which pursuit of an idea or principle overrides the simpler sort of self-interested behavior. While eminently plausible, this explanation poses a difficult challenge for economists as is it is singularly difficult to model in a way that allows for testable *a priori* predictions of actual behavior, when individuals are faced with choices involving "social" rather than "private" outcomes. (But see Brekke, *et al.*, 2003, for a promising beginning).

Even our models of how a firm will respond to the opportunity to obtain a label for its product are highly stylized and thus of limited usefulness in predicting how an actual labeling program, with actual consumers on the other side of the market, will turn out (*e.g.*, Kirchhoff, 2000). Thus, we would like, but are not able, to predict the percentage of products labeled, percentage of total sales involving labeled products, and therefore the extent of the change in environmental stress. Further, it would be useful to know where that change occurs, whether it builds or decays over time with enthusiasm for "the right thing", and what happens to product or process technology, and thus the label requirements, under the spur of the initial program.

In short, we know very little, as policy analysts, about how these popular instruments actually work. One might be tempted to say we know so little that it is amazing they have been adopted at all. But that would be to ignore the broad appeal of these instruments, particularly the political power of the claim that they represent the ultimate in non-coercive, truly market-based instruments after three and a half decades of coercion and dispute. For the remainder of this paper we hope to broaden the understanding of the potential of environmental labels to satisfy the static efficiency concerns of economists.

Product Labeling and Static Efficiency

A more optimistic view of the "promise" of environmental labels than the one stressing lack of coercion, is that they have a potential advantage over more traditional policy instruments in that they can lead to a reduction in the environmental damage associated with a polluting good in two different ways. First, like other forms of environmental regulation, labels could encourage manufacturers to improve the "environmental quality" of their products or production processes. While the incentive for such action provided by labels could come in several different forms,[5] we focus solely on the possibility that the labels may cause consumers to place a higher value on "environmentally superior" products and the possibility that firms might react to this change in consumer preferences by improving the environmental quality of their products. Our supposition for the change in consumer preferences lies not on the basis that consumers are optimizing over ambient environmental quality,[6] but on the basis that consumers have a preference for environmentally friendly products:

> If a consumer buys an environmentally-friendly product he produces a positive externality and helps preserving the environment. However, any individual consumer is likely to realize that his own impact on the environment is negligible. When he makes his own consumption decision, the overall state of the environment is in essence exogenously given. It is *aggregate*, rather than *individual*, behavior which affects the environment, and the individual consumer has no leverage on what others will do.
> A possible explanation for the observed consumption pattern is that individuals consider environment-friendliness as a particular quality attribute of the products they buy. In other words, consuming a variant with a high environmental quality is very much like any other quality attribute. There certainly is an externality involved, but what matters from an individual consumer's perspective is the

[5] The introductory chapter provides an overview of these different possible forms.
[6] This approach was used in the model employed in Kennedy, Laplante and Maxwell (1994), to consider the effect of providing environmental information to consumers who could allocate their consumption between a "clean" and a "dirty" good. Thus, consumer preferences for the environmentally superior good depend upon the extent to which their consumption degrades their own ambient environment. The paper nicely illustrates the market failures that arise, not only because consumers fail to internalize the effect of their consumption on others, but also because they fail to internalize the effect of their acquisition of information on the effect of this consumption on others.

> environmental quality of the product he personally buys. Cremer and Thisse (1999), p. 576.[7]

While this is clearly far from satisfactory - since it assumes away the question of why consumers do what they do - it does allow us to examine the results of such actions in ways parallel to those of the existing instrument choice literature. We can view the assumption as a place holder, with the place waiting for more good work to come out of the research into broadly altruistic actions by consumers.

All of which points to the second possible way for information provision to lessen environmental damage; it allows consumers with preferences for environmentally superior goods to alter their consumption in accordance with these preferences, reducing the consumption of environmentally inferior goods and increasing the consumption of environmentally superior goods. Thus, one might argue that environmental labels have the potential to open a second front in the regulation of environmental externalities – not only inducing manufacturers to produce cleaner products or employ cleaner processes, but also inducing consumers to purchase more of the cleaner products and less of the others (all without the need for government regulation in any formal sense, mind you). The possibility of changes in polluter output as well as abatement efforts suggests the

[7] A similar approach is utilized by Arora and Gangopadhyay (1995), who motivate green consumption by assuming that the level of cleaning technology employed by product manufacturers is an element in consumer utility functions and that consumers have identical preferences over this element, but differ in their marginal utility of money due to differences in income. As a result, their model predicts wealthier consumers will choose the environmentally superior products. Kirchoff (2000) also uses a product differentiation model to analyze the incorporation of environmental information into consumption decisions. However, her focus is on the use of information provision as a monitoring device for firm assertions about the environmental quality of its product, which she treats as a *credence good*, or a good for which quality is unobservable to consumers even after purchase.

need for a more general model than the type that is typically used in static efficiency analysis. We propose such a model in the following section.

The Model

More traditional environmental policies attempt to affect change in ambient environmental conditions through either changes in industry output or changes in abatement efforts. Since changes in industry output pose difficult questions of a general equilibrium nature, the models used to evaluate the static efficiency of environmental policies have traditionally taken both firm and industry output as given and considered emissions solely as a function of the level of abatement effort expended by the firm. However, environmental labeling – if it can affect both abatement efforts by firms and purchase decisions by consumers - requires a model that endogenizes individual firm output and considers the effects of changes in individual firm output on emissions and abatement costs. We ignore the possibility of a relationship between individual firm output and consumer surplus to keep our analysis comparable to that of traditional environmental policy instruments and because of the difficulty in modeling the effect of environmental labels on consumer welfare.[8] The model is presented first in a "base case" scenario where we assume that the regulatory agency is free to independently vary abatement effort and the distribution of output among the firms to generate an efficient result. We then restrict the model in accordance with the "traditional" assumption that

output is given and analyze the static efficiency properties of the traditional regulatory instruments. Finally, we consider an "environmental labeling case" where individual firm output is a function of the abatement efforts of all of the firms in the industry.

The Base Case

To incorporate changes in individual firm output, but avoid partial equilibrium concerns over the effect of changes in total output on the consumption and production of other goods, we allow individual firm output or market share, x_i, to vary but assume perfectly inelastic total market demand[9] and normalize aggregate output for an n-firm industry to one, or $\sum_{i=1}^{n} x_i = 1$. Firm emissions, E_i, are assumed to be a decreasing function of abatement effort, q_i. and an increasing function of output:

$$E_i = e_i(q_i, x_i) \qquad \text{where } \frac{\partial E_i}{\partial q_i} < 0, \quad \frac{\partial E_i}{\partial x_i} > 0$$

Total firm abatement costs, C_i, are an increasing function of both abatement effort and output:

$$C_i = c_i(q_i, x_i) \qquad \text{where } \frac{\partial C_i}{\partial q_i} > 0, \quad \frac{\partial C_i}{\partial x_i} > 0$$

For simplicity, aggregate environmental damages, D, are assumed to be equal to the aggregate level of emissions for this industry:

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[8] It is one thing to assume that consumers have these preferences; it is quite another to specify what they look like in any detail. For example, do consumers of environmentally inferior products suffer disutility as a result of the provision of information?

[9] This assumption follows Cremer and Thisse (1999) and Tirole (1988), and amounts to assuming that, while information on environmental performance may affect relative demand for the different versions of the differentiated product, it will not affect demand for the product as a whole.

$$D = \sum_{i=1}^{n} E_i = \sum_{i=1}^{n} e_i(q_i, x_i)$$

Static efficiency for this industry can be obtained by minimizing the sum of aggregate abatement costs and environmental damage over both firm choice of abatement and the allocation of output or market share among the firms:

$$\min_{q_i,\ldots q_n,\, x_i,\ldots x_n} \sum_{i=1}^{n} c_i(q_i, x_i) + \alpha \sum_{i=1}^{n} e_i(q_i, x_i) \quad s.t. \quad q_i \geq 0,\, x_i \geq 0, \vee i \; and \; \sum_{i=1}^{n} x_i = 1$$

where α is a constant meant to remind us of the need to translate environmental damages and firm costs into equivalent units. We can rewrite this objective function in the form of a Lagrangian multiplier:

$$\max_{q_i,\ldots q_n,\, x_i,\ldots x_n} L = -\sum_{i=1}^{n} c_i(q_i, x_i) - \alpha \sum_{i=1}^{n} e_i(q_i, x_i) + \sum_{i=1}^{n} \lambda_{1i} q_i + \sum_{i=1}^{n} \lambda_{2i} x_i - \lambda_3 \left(\sum_{i=1}^{n} x_i - 1 \right)$$

Assuming, for simplicity, that $\alpha = 1$ and the presence of an interior solution, the solution of this optimization problem provides two distinct sets of first order conditions. The first set - corresponding to optimization over abatement effort (the "Abatement Conditions") – are familiar ones, requiring that the change in abatement costs associated with a change in abatement effort equal the marginal benefit of the corresponding reduction in environmental damage:

$$\begin{aligned} &\frac{\partial c_1}{\partial q_1} + \frac{\partial e_1}{\partial q_1} = 0 \\ &\quad \vdots \qquad\qquad \vdots \\ &\frac{\partial c_n}{\partial q_n} + \frac{\partial e_n}{\partial q_n} = 0 \end{aligned}$$

The second set – corresponding to optimization over individual firm output (the "Output Conditions") - requires that market share or output be efficiently allocated among the firms in the

industry, such that the marginal social costs of an increase in the output of any one firm are equal to the marginal social benefits of the aggregate decrease in the output of the other firms:

$$\frac{\partial c_1}{\partial x_1}+\frac{\partial e_1}{\partial x_1}+\left(\frac{\partial c_2}{\partial x_2}+\frac{\partial e_2}{\partial x_2}\right)\frac{\partial x_2}{\partial x_1}+\cdots+\left(\frac{\partial c_n}{\partial x_n}+\frac{\partial e_n}{\partial x_n}\right)\frac{\partial x_n}{\partial x_1}=0$$
$$\vdots \qquad\qquad \vdots$$
$$\frac{\partial c_n}{\partial x_n}+\frac{\partial e_n}{\partial x_n}+\left(\frac{\partial c_1}{\partial x_1}+\frac{\partial e_1}{\partial x_1}\right)\frac{\partial x_1}{\partial x_n}+\cdots+\left(\frac{\partial c_{n-1}}{\partial x_{n-1}}+\frac{\partial e_{n-1}}{\partial x_{n-1}}\right)\frac{\partial x_{n-1}}{\partial x_n}=0$$

where $\frac{\partial c_i}{\partial x_i}$ represents the marginal private costs of an increase in output and $\frac{\partial e_i}{\partial x_i}$ represents the marginal public costs of an increase in output. Given our assumption of perfectly inelastic demand, if these marginal private and public costs are equal and constant across all firms, then the Output Conditions will always be satisfied and the allocation of output will be irrelevant to social welfare. If these marginal cost functions are identical but not constant, then the Output Conditions will be satisfied only when output is evenly distributed amongst the firms.

By relaxing the assumption of fixed output, we have created a more general model that produces a more general set of efficiency conditions. Now, let us consider two different subsets of this base case – where demand or output is assumed to be given – the "naive" or "traditional" case - and where demand or output is a function of choice of abatement level – the "environmental labeling" case.

The Traditional Case

For this case, the functional forms are exactly as in the base case, except that output is assumed fixed, or:

$$E_i = e_i(q_i, \bar{x}_i) \qquad \text{where } \frac{\partial E_i}{\partial q_i} < 0$$

and

$$C_i = c_i(q_i, \bar{x}_i) \qquad \text{where } \frac{\partial C_i}{\partial q_i} > 0$$

In this case, the optimization problem becomes:

$$\min_{q_i,\ldots q_n} \sum_{i=1}^{n} c_i(q_i, \bar{x}_i) + \alpha \sum_{i=1}^{n} e_i(q_i, \bar{x}_i) \quad s.t. \quad q_i \geq 0$$

or:

$$\max_{q_i,\ldots q_n} L = -\sum_{i=1}^{n} c_i(q_i, \bar{x}_i) - \alpha \sum_{i=1}^{n} e_i(q_i, \bar{x}_i) + \sum_{i=1}^{n} \lambda(q_i)$$

Again, assuming $\alpha = 1$ and an interior solution, the first order conditions are simply the Abatement Conditions from the base case:

$$\begin{array}{c} \frac{\partial c_1}{\partial q_1} + \frac{\partial e_1}{\partial q_1} = 0 \\ \vdots \qquad\qquad \vdots \\ \frac{\partial c_n}{\partial q_n} + \frac{\partial e_n}{\partial q_n} = 0 \end{array}$$

Static efficiency, given fixed output, then requires that abatement levels are set where marginal costs equal marginal benefits (*i.e.*, the reduction of marginal damages). Thus, satisfaction of the efficiency conditions of this case will satisfy the efficiency conditions from the base case if the initial distribution of output happens to be the one that satisfies the Output Conditions from the base case, or if marginal social costs are equal and constant.

The Environmental Labeling Case

For the labeling case, we assume that each firm produces a single variety of a good and that the variety is differentiated only by its environmental quality or performance. In the absence of an environmental information provision program, there is an asymmetry of information between firms and consumers, in which firms know the levels of the environmental attributes of their products, but consumers do not. Although "clean" firms could release the information on their own, it is assumed that consumers would disregard it without third party verification. Thus, unless a program exists, consumers behave as if they have lexicographic preferences, basing consumption decisions solely on the values of observable product attributes and, firm output is assumed to be independent of the level of abatement effort. However, in the presence of an information provision program the information asymmetry is cured,[10] the market share or output of each firm is a function of the level of abatement of all of the firms:

$$X_i = x_i(q_i, q_j, \cdots q_n)$$

Firm emissions are a function of abatement and output:

$$E_i = e_i(q_i, x_i(q_i, q_j, \cdots q_n))$$

Firm costs are also a function of abatement and output:

$$C_i = c_i(q_i, x_i(q_i, q_j, \cdots q_n))$$

Efficiency for this market **(**assuming away any utility consumers might derive from the consumption of the differentiated good**)** can be obtained by minimizing aggregate abatement costs and environmental damage:

[10] We abstract from the issues presented by positive costs of acquiring and using the information.

$$\min_{q_i,\ldots q_n} \sum_{i=1}^{n} c_i(q_i, x_i(q_i, q_j)) + \alpha \sum_{i=1}^{n} e_i(q_i, x_i(q_i, q_j)) \quad s.t. \quad q_i \geq 0,\ x_i \geq 0, \vee i \ and \sum_{i=1}^{n} x_i = 1$$

or:

$$\max_{q_i,\ldots q_n} L = -\sum_{i=1}^{n} c_i(q_i, x_i(q_i, q_j)) - \alpha \sum_{i=1}^{n} e_i(q_i, x_i(q_i, q_j)) + \sum_{i=1}^{n} \lambda_{1i} q_i + \sum_{i=1}^{n} \lambda_{2i} x_i - \lambda_3 \left(\sum_{i=1}^{n} x_i - 1 \right)$$

Assuming $\alpha = 1$ and an interior solution, the first order conditions for this problem are equal to:

$$\frac{\partial c_1}{\partial q_1} + \frac{\partial e_1}{\partial q_1} + \left(\frac{\partial c_1}{\partial x_1} + \frac{\partial e_1}{\partial x_1} \right) \frac{\partial x_1}{\partial q_1} + \left(\frac{\partial c_2}{\partial x_2} + \frac{\partial e_2}{\partial x_2} \right) \frac{\partial x_2}{\partial q_1} + \cdots + \left(\frac{\partial c_n}{\partial x_n} + \frac{\partial e_n}{\partial x_n} \right) \frac{\partial x_n}{\partial q_1} = 0$$

$$\vdots \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \vdots$$

$$\frac{\partial c_n}{\partial q_n} + \frac{\partial e_n}{\partial q_n} + \left(\frac{\partial c_n}{\partial x_n} + \frac{\partial e_n}{\partial x_n} \right) \frac{\partial x_n}{\partial q_n} + \left(\frac{\partial c_1}{\partial x_1} + \frac{\partial e_1}{\partial x_1} \right) \frac{\partial x_1}{\partial q_n} + \cdots + \left(\frac{\partial c_{n-1}}{\partial x_{n-1}} + \frac{\partial e_{n-1}}{\partial x_{n-1}} \right) \frac{\partial x_{n-1}}{\partial q_n} = 0$$

These conditions consider not only the "direct effects" of a change in abatement effort on firm costs and emissions, which are captured in the first two terms in each condition (and are identical to the Abatement Conditions from the base case), but also the "indirect effects" that occur via the changes in the output of the different varieties as a result of the change in abatement effort of any one variety. These indirect effects, which are represented by the last *n* terms in each condition, are, in aggregate, the sum of the marginal social costs of changes in individual firm output weighted by the change in each individual firm's output associated with a change in the abatement effort. If marginal private and public costs are constant and equal across firms, then these conditions will reduce to the Abatement Conditions from the base and traditional cases and the efficiency conditions of all three cases will be equivalent.

Thus, in the traditional case there is a type of failure associated with our inability to optimize over output or market share, as it is assumed to be exogenous. Environmental labels hold out some promise of allowing regulators to affect market share. However, this promise is

tempered by two considerations. Successfully manipulating output requires knowledge of how consumers will respond to a change in abatement effort and how firms will respond to the consumer actions – both difficult propositions at best. Even if an agency possessed this knowledge (along with the requisite information on marginal cost and damage functions), optimization in the information provision case is essentially a constrained version of optimization in the base case, where the constraint is that market shares are a function of abatement efforts. Thus, a regulatory agency is not free to independently manipulate abatement and output, as in the base case. This implies that the efficiency conditions from the base case are more general than those from the labeling case and satisfaction of the labeling conditions will not necessarily result in an outcome that is "as efficient" as an optimal outcome under the base case.

An obvious question at this point is whether there is anything that can be said about how the conditions from the traditional and labeling cases compare with one another. Both represent constrained versions of the base case in that they impose restrictions on firm output thereby reducing the number of regulatory levers from two (abatement and output) to one (abatement). However, they differ in the nature of the restriction they place on output – the Traditional Case assumes it is fixed, while the labeling case assumes it is a function of the abatement efforts of all of the firms in the industry. In general terms, neither is more or less restrictive than the other and thus, neither case provides a set of conditions, the satisfaction of which, guarantees an outcome that is unambiguously superior to any outcome under the other.

Conclusion

The framework proffered in this Chapter has been used to show that there is no general, theoretic basis for concluding that the ability of environmental labeling to influence both product design and/or production processes and consumer choice of competing products holds more promise as a means of achieving static efficiency than more traditional market-based environmental policy instruments. Thus, while the "deputizing" of third parties is the ultimate source of much of the political appeal of information provision, it would appear that it is also the source of much of the weakness of information provision as an instrument of environmental policy, at least when examined against the static efficiency criterion. This analysis should contribute to the understanding of the welfare properties of environmental labeling programs, which has lagged far behind the adoption of these programs. However, this analysis is incomplete and suffers from the lack of satisfactory models of firm and consumer behavior; or, where those models do exist, guidance in choosing among them. Further research, of both a theoretical and empirical nature, is needed. Possible extensions of the analysis performed here include the incorporation of consumer utility in the social welfare function and the consideration of alternative or blended policies, such as a market-based incentive (*e.g.*, tax or subsidy) with an environmental labeling program (*e.g.*, a report card type of program).

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